Appendix F

Ecological Guild Assessment

Item 251

Comment: *Need to use an ecological guild model that uses locally important species to evaluate project impacts to organisms or populations associated with the various trophic levels and life history strategies of species known to occupy the project site.*

Requestor: NOAA

Response: The following is offered as a supplement to Topic Report 4 (Biological Resources) in reference to the above comment.

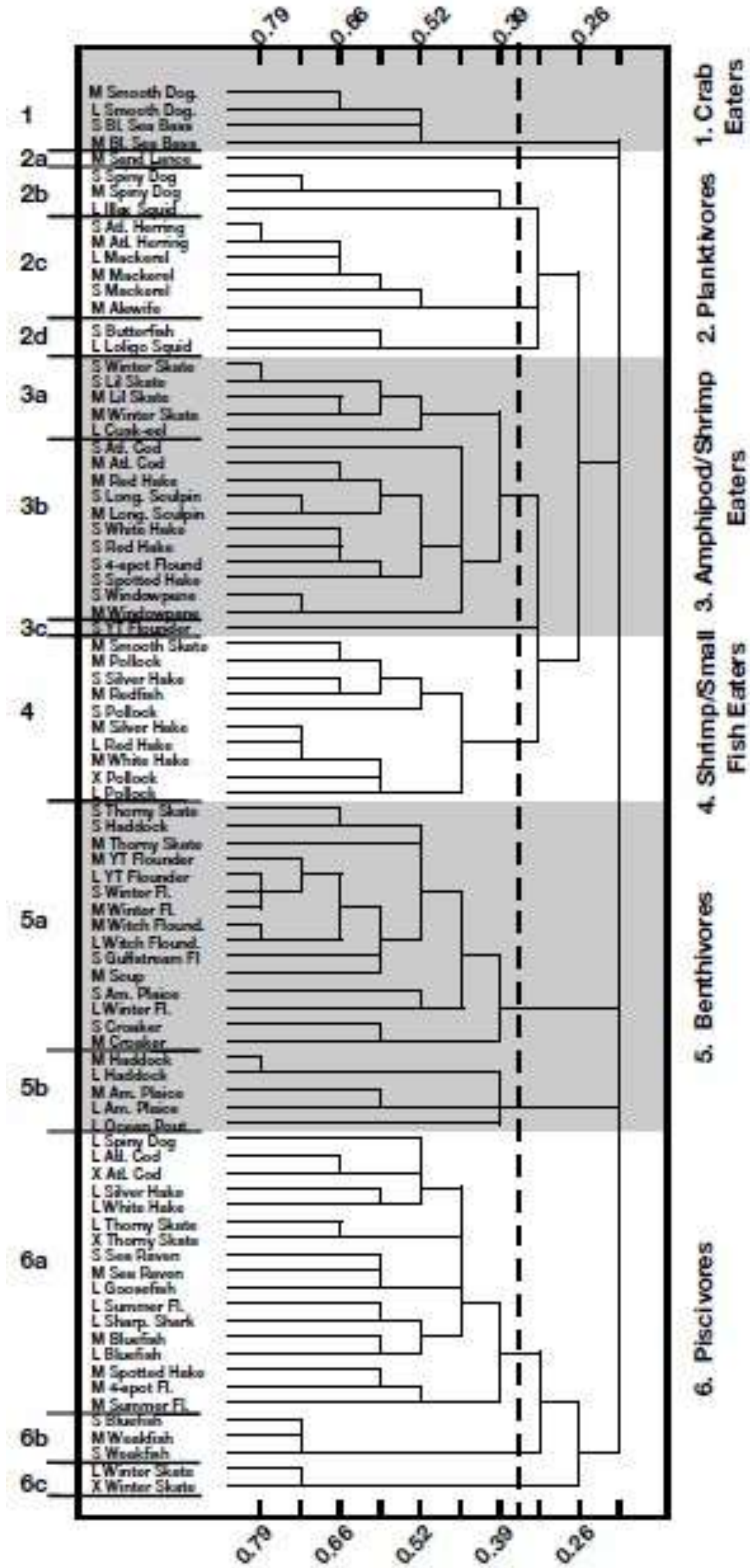
Existing Conditions

Feeding guilds generally contain species with similar diets (Auster, 2009). In order to determine guild types for further evaluation that may be present at the proposed Project site, a literary review was conducted of pertinent research associated with guild modeling and species presence. Specifically, this research included understanding spatial and temporal species distribution and abundance of locally important species at the proposed Project site, commercial fishery types and degree of catch effort, commercial catch trends, species diet, and general physical parameters associated with preferred habitat. Garrison and Link (2000) evaluated the trophic guild structure in an assemblage of 40 fish species in the Northeast United States (NEUS) shelf ecosystem and discovered there were 14 significant trophic guilds that could be categorized into six (6) trophic groups. These groups included crab eaters, planktivores, amphipod/shrimp eaters, shrimp/small fish eaters, benthivores, and piscivores. These were subsequently subdivided into the aforementioned 14 guilds. Smith and Link (2010) examined trophic dynamics of 50 fish and 2 squid species across the NEUS continental shelf with respect to decadal, spatial, seasonal, and ontogenetic variations in feeding habits. This study adopted the trophic guild classifications (e.g., planktivorous or benthivorous) from Garrison and Link (2000) and results supported that there was no change in guild type for the NEUS.

To further identify guild types, it is important to show relevance between known guild types from larger regions like the NEUS in comparison to those guild types from a smaller area (like the proposed Project site). A study in Georges Bank created a model of a marine food web through the observed harvest of the commercial fishing industry for three top-level trophic feeding guilds: planktivores, benthivores, and piscivores (Collie *et al.* 2009). The three guilds identified in Georges Bank are synonymous with three of the trophic groups identified in the NEUS study, so it would appear that guild and trophic groups are also synonymous. Feeding guilds in the California Current were determined by using hierarchical cluster analysis and calculated diet overlaps based on percent similarity index (PSI).This cluster analysis determined that 10 key functional guilds composed of multiple predators existed within the California Current (Dufault *et al.*2009). Based on the aforementioned studies, it was determined that possible guilds associated with the Project area could number between three and 14. Though species composition would vary by geography, it can be further determined that similar guild types described above could be applied to the evaluation of impacts at the proposed Project site (dependent on forage species availability and habitat).

One final factor considered in determining the number and type of guilds at the proposed Project site to be evaluated was identifying species commercially exploited at the site and effects from that fishing on species abundance and distribution. Garrison and Link (2000) noted that in the NEUS continental shelf fish community, commercial fishery exploitation had caused major changes in community structure since the 1970's due to overfishing and/or increased catch effort that reduced commercially exploited groundfish and pelagic stocks while increasing the biomass of less exploited species. Since their research, it can be assumed that there has been further change in community structure of both commercially sought and less exploited species. Taking into consideration the effect of commercial fishing might have on community structure at or near the site, known depth of predatory species, and the proposed location of the Project relevant to known species and prey distribution, the 14 trophic guilds identified by Garrison and Link (2000) have been consolidated into six (6) groups or guilds for further impact evaluation from the construction and operation of the proposed Port Ambrose Project. These guilds, as given by Garrison and Link (2000) include crab eaters, planktivores, amphipod/shrimp eaters, shrimp/small fish eaters, benthivores, and piscivores. Impact assessments to Essential Fish Habitat by life stage for federally-managed species identified in the proposed Project site as well as other non-federal species are discussed in detail in Volume II Topic Report 4 – Biological Resources.

The following cluster diagram prepared by Garrison and Link (2000) lists 40 species known to occur within the NEUS, and subsequently, provides the best representative guild structure at and adjacent to the proposed Project site. The diagram further categorizes each species into six specific guilds based on similarities in diet at very broad taxonomic levels to reflect different utilization of specific prey types. Species distribution and preferred diet was further confirmed by identifying known commercial and recreational fishing grounds (DeAlteris *et al.* 2009; NJDEP 2003; and Long and Figley, 1982) and biological descriptions given in Bigelow and Schroeder's Fishes of the Gulf of Maine (Collette and Klein-MacPhee, 2002).



Source: Garrison and Link, 2000.

A brief description of each of the six guilds is provided below. Some species have been omitted based on known presence as given in data collected offshore by the New Jersey Ocean Trawl Program and NOAA. Size descriptions are based on those provided by Garrison and Link (2000) and include ranges for small from 10 to 40 centimeters (species dependent), 21 to 70 centimeters for medium-sized species (species dependent), 51 to greater than 80 centimeters for large sized specimens (species dependent), and greater than 80 centimeters for extra large.

Crab-Eaters

Representative species of this guild consist of small and medium sized smooth dogfish (*Mustelus canis*) and small and medium sized black sea bass (*Centropristis striata*). As identified through stomach content analysis by Garrison and Link (2000), diet consisted mostly of crab species from the family Cancridae and other unclassified decapod crabs. Additionally, zooplankton and bivalves were also important prey items.

Planktivores

Representative species of this guild consist of a number of species to include small-sized spiny dogfish (*Squalus acanthias*), Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), menhaden (*Brevoortia tyrannus*) and small Atlantic butterfish (*Peprilus triacanthus*); medium-sized American sand lance (*Ammodytes americanus*), spiny dogfish, Atlantic herring, Atlantic mackerel, menhaden, and alewife (*Alosa pseudoharengus*); and large illex squid (*Illex illecebrosus*), loligo squid (*Loligo pealei*), and Atlantic mackerel. As identified through stomach content analysis by Garrison and Link (2000), diet consists of zooplankton for sand lance; cephlapods and fish for small and medium spiny dogfish and illex squid with ctenophores also an important spiny dogfish prey organism; zooplankton, euphausiids, and shrimp for Atlantic herring and mackerel; and zooplankton, small fish and animal remains for Atlantic butterfish and loligo squid.

Amphipod/Shrimp Eaters

Representative species of this guild consist of small-sized winter skates (*Leucoraja ocellata*), little skates (*Leucoraja erinacea*), longhorn sculpin (*Myoxocephalus octodecemspinosus*), white hake (*Urophycis tenuis*), red hake (*Urophycis chuss*), four-spotted flounder (*Paralichthys* oblongus), spotted hake (*Urophycis regia*), yellowtail flounder (*Pleuronectes ferruginea*) and windowpane (*Scophthalmus aquosus*); medium-sized winter skates, little skates, Atlantic cod (*Gadus morhua*); red hake, longhorn sculpin, and widowpane; and large-sized cusk eel (*Lepophidium profundorum*). As identified through stomach content analysis by Garrison and Link (2000), diet consists of small benthic prey and pelagic shrimp for the following: Small winter and little skates have diets dominated by amphipods and polychaetes as well as pelagic organisms to include shrimp and zooplankton; small Atlantic cod, all sizes of longhorn sculpin, and small hakes have diets consisting of a number of shrimp taxa, amphipods, crabs, and unidentified fish; and small yellowtail flounder diet consists mostly of amphipods.

Shrimp/Small Fish Eaters

Representative species of this guild consist of small-sized pollock (*Pollachius virens*) and silver hake (*Merluccius bilinearis*); medium-sized silver hake, white hake, and pollock; large-sized red hake and pollock, and extra-large-sized pollock. As identified through stomach content analysis by Garrison and Link (2000), diet is dominated for all species with various taxa of shrimp. Other dietary components include euphausiids, other shrimp, pandalid shrimps, and unclassified decapod shrimps. In addition to shrimp, small fish prey are also important and included unidentified fish, silver hake, sand lance, and Atlantic herring.

Benthivores

Representative species of this guild consist of small-sized haddock (*Melanogrammus aeglefinus*), winter flounder (*Pseudopleuronectes americanus*), gulfstream flounder (*Citharichthys arctifrons*), Atlantic croaker (*Micropogon undulatus*), and American plaice (*Hippoglossoides platessoides*); medium-sized yellowtail flounder, winter flounder, scup (*Stenotomus chrysops*), Atlantic croaker, haddock, American plaice, and witch flounder (*Glyptocephalus cynoglossus*); and large-sized yellowtail flounder, witch flounder, winter flounder, haddock, American plaice, and ocean pout (*Macrozoarces americanus*). As identified through stomach content analysis by Garrison and Link (2000), diet consists largely of polychaetes for winter flounder, yellowtail flounder, and witch flounder and a large proportion of echinoderms and ophiuroids for large haddock and American plaice.

Piscavores

Representative species of this guild consist of small-sized sea raven (*Hemitripterus americanus*), bluefish (*Pomatomus saltatrix*), and weakfish (*Cynoscion regalis*); medium-sized sea raven, bluefish, spotted hake, four-spotted flounder, summer flounder (*Paralichthys dentatus*), and weakfish; large-sized spiny dogfish, Atlantic cod, silver hake, white hake, goosefish (*Lophius americanus*), summer flounder, various shark species, bluefish, and winter skate; and extra-large-sized Atlantic cod and winter skate. As identified through stomach content analysis by Garrison and Link (2000), diet consists of a range of fish including Atlantic herring and other clupeids, silver hake, scombrids, and sand lance. Squid taxa are also an important component of the diets of these predators. Small bluefish and weakfish consume primarily Engraulid anchovies and large winter skates are also known to consume a large portion of American sand lance.

Impacts From Construction, Operation and Emergency Repair/Maintenance

Crab-Eaters

The abundance and distribution of the prey species of crab eaters may be impacted during construction due to displacement from the area; however, construction activities associated with the proposed Project are not likely to remove critical amounts of prey resources. In addition, abundant similar foraging areas are located outside of the immediate vicinity of the proposed Project. Therefore, any construction impacts associated with alteration to prey species abundance and distribution are expected to be short term and minor.

In the area of the Port, there will be a minimal amount of benthic substrate permanently impacted through placement of the STL Buoy systems and rocky backfill materials. The placement of these structures will prevent recolonization of the substrate directly below them for the lifespan of the Port. However, the placement of hard substrate (PLEMs, anchors, STL Buoy landing pads, and rocky material) within previously unconsolidated sediments will provide habitat for colonization by a faunal community which is likely to include species of sponges (*Porifera*), Hydrozoa and Bryozoa. They will also provide a source of shelter for lobsters and crabs in the Port area. There are no naturally occurring hard bottom areas in the vicinity of the Port, so the addition of hard substrate may encourage new species or enhance density of others already present.

Planktivores

An Ichthyoplankton Entrainment Assessment was conducted for the site and is given in Appendix D (Revised) of Topic Report 4 – Biological Resources to identify potential losses from entrainment during construction, operation and decommissioning of the Port Ambrose facility. Potential entrainment losses due to these activity intakes were estimated using egg and larval density estimates from MARMAP/ECOMON long-term fish monitoring projects. The whole dataset for the selected stations from 1977 to 2008 was used to provide a more complete picture of abundance and provide level of impact. This data, in turn, can be used to evaluate impact to planktivores.

Estimated entrainment for the construction phase of the facility is 44,027,806 eggs and 5,075,044 larvae of fish. Estimated annual entrainment during operation, emergency and maintenance activities of the facility is 40,070,732 eggs and 5,986,906 larvae. Estimated entrainment during decommissioning of the facility is 2,573,528 eggs and 296,648 larvae. This results in a loss of 24,138 age-1 equivalent fish during construction, 24,106 age-1 equivalent fish annually during operation, emergency and maintenance and a loss of 1,411 age-1 equivalent fish during decommissioning of the facility. These numbers equate to approximately 3,270 pounds of foregone fishery yield with an annual value of $2,262.04. This equates to a very small percentage (much less than 1%) of the annual commercial and recreational fishery harvest. Based on estimated existing abundance and estimated values of impact, entrainment impacts from Port Ambrose are expected to be very minor due to its location in a low-productivity, off-shore area and its relatively limited water withdrawals. Impingement impacts are not expected to occur as intake velocities will be less than 0.5 ft/sec during both construction and operation.

Amphipod/Shrimp Eaters

As previously stated, the diet for amphipod/shrimp eaters consists of small benthic prey and pelagic shrimp to include amphipods, polychaetes, crabs, as well as pelagic organisms to include shrimp and zooplankton. Impacts to these forage species would be similar to those summarized for benthivores and shrimp/small fish eaters (discussed below). It is anticipated that impacts from construction and operation will be minimal.

Shrimp/Small Fish Eaters

The potential impacts on fish resources to shrimp/small fish eaters as a result of the proposed construction include direct impacts from alteration of habitat and impingement and entrainment and potential indirect impacts from turbidity, noise, water quality, and lighting. Impacts to small shrimp forage species would be similar to that for planktivores. Significant impacts on fish resources, however, are not anticipated. In general, fish are highly mobile organisms that can move away from areas with unfavorable conditions.

Mobile fish and invertebrates that are displaced during construction of the Port area are expected to return quickly following construction. A permanent impact to approximately three acres of sea floor is expected in the area of the Port due to buoy placement and anchor impacts. Impacts beyond the permanent footprint of the proposed Port and the area encompassing the cable sweep of the STL Buoy anchor chains are anticipated to be temporary and short-term.

Benthivores

The majority of impacts on marine benthic communities will occur during construction of the Mainline and Laterals. The pipe laying process will directly impact benthic habitat temporarily during pipeline construction. A total of approximately 219 acres (89 ha) of sea floor are expected to be impacted during construction of the Mainline and other Port structures. The lowering process used for the entire route (21.67 mi [34.87 km]) will be plowing. Hand jetting will be used to install the SSTI and the CYA, and at discrete locations where existing cables are crossed. The plowing process will involve creating a V-shaped trench underneath the pipe and pushing the sediment to the sides, creating a total disturbed width (trench plus adjoining spoil piles) of approximately 75 ft (23 m). The plowed substrate is inverted, which likely will prove lethal to most organisms within the plowed area, and the side cast likely will kill most organisms buried. Burial depths of 20 in (51 cm) or more in sandy substrates will cause significant mortality (2 to 60 percent) in softshell clams (Emerson et al. 1990). During backfilling, the spoil alongside the trench will be pushed back into the trench on top of the pipe. Additional but minor impacts on the benthic community will occur due to construction vessel anchoring (fixed anchor drop) at the SSTI.

Predictive modeling for Port Ambrose is that outside the immediate impact area, sediment deposition greater than 20 mm (0.8 in) will generally be limited to the immediate vicinity of the pipeline (within approximately 150 ft (46 m) in State waters and within 100 ft (30 m) in Federal waters). Sediment deposition in excess of 5 mm (0.2 in) is predicted to be mainly limited to within approximately 500 ft (152 m) of the pipeline centerline in State waters and within 250 ft (76 m) in Federal waters. Isolated areas of elevated deposition may occur at greater distances, up to approximately 1,200 ft (366 m) for 20 mm (0.8 in) thickness and up to approximately 2,600 ft (792 m) for 5 mm (0.2 in) thickness. In general measurable depositional thicknesses are predicted to occur only in close proximity to the Mainline and the Laterals (Hodge and Silva, 2014).

Once the construction process is completed, the benthic animals in the surrounding sediment will be expected to recolonize the disturbed sediments within a year. Algonquin's HubLine marine pipeline project's post-construction monitoring program determined that colonization had occurred within the first year after construction and/or that some organisms survived the pipe-laying and burial processes (Northeast Gateway 2005). Therefore, because the Port Ambrose Project has similar conditions, it is expected that the impacts on the benthic community from pipeline construction, which will be localized to the construction corridor, will be short-term.

There will be no operational impacts on benthic habitat associated with the Mainline or the Laterals, since they will be covered with soft-bottom materials and available for colonization within a short time after construction. The cover over these pipelines will not be disturbed during normal operations. However, repairs to the pipelines or other unplanned maintenance could impact benthic communities during operations, but these impacts would be very localized and minor, and recovery after the disturbance would occur quickly.

In addition to the small amount of benthic habitat permanently lost to the STL Buoy structures, the benthic substrate in close proximity to seafloor structures at the Port will be impacted by anchor chain/wire sweep. This area of the sea floor will be unable to be colonized by a static benthic faunal community and will remain essentially uninhabited until the Port is no longer in use.

Piscavores

Siting of the proposed Project was performed with a goal to avoid impacts on documented areas of hardbottom (including artificial reefs) and live bottom habitats, which are known to provide EFH. However, construction activities (primarily plowing and jetting for pipeline installation) will result in temporary loss of soft-bottom habitat along the Mainline and Laterals routes and at the Port. Species most likely to be affected are species that prefer soft-bottom habitat, especially demersal species, including butterfish, goosefish, redfish, red hake, silver hake, smooth skate, thorny skate, white hake, winter flounder, witch flounder, and yellowtail flounder. These species may be displaced temporarily from the construction area but are expected to return quickly to the area when construction has been completed.

Burial of the pipelines could result in direct, minor adverse impacts not only from the dispersion of fish from the area, but from the burying or crushing of shellfish. However, it also could have temporary, indirect, beneficial impacts from exposing benthic food sources for benthivores and amphipod/shrimp eaters. Turbidity and noise associated with the installation of the proposed Port and Mainline also could cause fish to disperse from the area temporarily; however, turbidity will be localized and noise temporary, and they should not impact foraging within adjacent areas. It also is anticipated that background turbidity levels will return within 24-hours of disturbance (Hodge and Silva, 2014). Thus, any impacts on foraging are anticipated to be short-term and insignificant.

Operational impacts include impacts associated with habitat loss, turbidity (anchor chain sweep), and noise (intermittant and minor). Due to the abundance of suitable habitat outside of the Port area, this short-term displacement and avoidance will not constitute a significant impact. Mobile organisms are expected to return to the Port area immediately following any activity (within a matter of days) and with them the piscivores. For low-level background operational noises and low anchor chain turbidity increases, some organisms may not vacate the area, the avoidance levels probably being species-specific. For these reasons, operation of the Port is not expected to result in significant impacts on fish resources.

References:

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Legend

- Mainline
- Existing TRANSCO New York Bay Lateral
- Three Nautical Mile Line
- Bathymetry (5 meter)

Grain Size

- Fine Sand
- Fine Sand with Medium Sand
- Gravel with Sand
- Medium Sand with Fine Sand
- Medium Sand with Gravel
- Sand

Grain size and species grouping data source: Deepwater Port License Application - Volume II, Port Ambrose Project, Environmental Evaluation, Topic Report 4, Biological Resources, Appendix C January – February 2012 Environmental Survey Report, September 2012

N

0 1 2 4 Nautical Miles

0 1 2 4 Miles

Scale: 1:100000

Benthic Resources and Habitats

AECOM

PORTAMBROSE

Date: March 2014

Project #: 60218596